STATUS OF FOREST INSECT AND DISEASE CONDITIONS AND PROGRAMS in the Intermountain Region 1973

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TABLE OF CONTENTS

Subject **Page**

Names and Titles of Insect and Disease Control Staff iii

RESUMÉ OF CONDITIONS

Entomology 1
Pathology 1

ENTOMOLOGY

Bark Beetles

Mountain pine beetle - lodgepole pine 2
Mountain pine beetle - ponderosa pine 4
Douglas-fir beetle 4
Engelmann spruce beetle 5
Roundheaded pine beetle 5
Pine engraver beetle - lodgepole pine 5
Pine engraver beetle - ponderosa pine 5

Defoliators

Western spruce budworm 5
Douglas-fir tussock moth 6
Pine butterfly 6
A sawfly 8
A leafroller 8
A defoliator 8

PATHOLOGY

Dwarf mistletoe 8
Air pollution 9

MAP

Distribution of major forest insects ..... Appendix

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RESUMÉ OF CONDITIONS

ENTOMOLOGY

Mountain pine beetle, *Dendroctonus ponderosae* Hopkins, infestations continued to decline in most lodgepole pine, *Pinus contorta latifolia* Engelm., forests in the Intermountain Region in 1973. However, damaging infestations intensified in localized areas at the northern end of the Targhee National Forest, Idaho, and in the northern portions of the Bridger-Teton National Forest[1] and Grand Teton National Park, Wyoming. Long-standing outbreaks in the Greys River and along the west slope of the Wind River Range continued to decrease. Persistent infestations on the north slope of the Uinta Mountains in Utah and Wyoming occurred for another year. An outbreak on the Ashley National Forest and Flaming Gorge National Recreation Area increased in extent, but fewer trees were killed in 1973 than in 1972. Widely scattered killing of lodgepole pine occurred on the Boise, Sawtooth, and Caribou National Forests.

Regionwide, killing of ponderosa pine, *Pinus ponderosa* Laws., by the mountain pine beetle dropped to its lowest level in over five years. The most troublesome infestation was in the Flaming Gorge National Recreation Area where trees were being killed in high use areas. Infestations in Bryce Canyon National Park and the neighboring Dixie National Forest declined to a low level. A 10-year-long outbreak in densely stocked, stagnated, second-growth ponderosa pine stands southeast of Cascade, Idaho, showed no sign of declining.

Killing of Douglas-fir, *Pseudotsuga menziesii* Franco, by the Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins, occurred throughout much of southern Idaho in 1973. An infestation on the Targhee National Forest caused heavy losses. Tree killing on the Boise National Forest in 1973 was above the level recorded in 1972. A general decline in activity occurred on the Challis and Sawtooth National Forests.

For the fifth consecutive year, the Engelmann spruce beetle, *Dendroctonus rufipennis* (Kirby), depleted Engelmann spruce, *Picea engelmannii* Parry, stands on the Manti-LaSal National Forest, Utah. Elsewhere in Utah, widely scattered tree killing was detected on the Uinta and Wasatch National Forests.

An outbreak of the roundheaded pine beetle, *Dendroctonus adjunctus* Blandford, subsided in the Spring Mountains of southwestern Nevada.

It was estimated that pine engraver beetles, *Ips* spp., killed a considerable number of small diameter lodgepole pines in mountain pine beetle depleted stands on the Targhee National Forest. Potentially damaging populations of pine engraver beetles in ponderosa pine were suppressed in five areas of southeastern Idaho.

The western spruce budworm *Choristoneura occidentalis* Freeman, remained the most serious defoliator in the Intermountain Region, but the level of defoliation was well below that recorded in previous years. The most significant decline occurred in portions of the Bridger-Teton and Targhee National Forests, Wyoming. Predictions of reduced budworm activity for 1974 are even more encouraging; some areas of heavy defoliation will continue, such as on the Payette National Forest, but a general Regionwide reduction should occur.

Douglas-fir tussock moth, *Hemerocampa pseudotsugata* (McDunnough), generally appears to be on the decline, except in two areas near Fairfield, Idaho. A control program may be undertaken in 1974 to suppress the potentially damaging population on 1,200 acres of Douglas-fir.

Egg mass surveys indicated a downward trend in pine butterfly, *Neophasia menapia* (Felder & Felder), populations in 1973.

Other defoliator conditions are discussed.

PATHOLOGY

Five dwarf mistletoe projects were completed this year. A total of 400 acres were treated. Control consisted of removal of noncommercial infected overstory and sanitation thinning of advanced regeneration.

Vegetation plots on Federal lands near the Navajo Generating Station, Page, Arizona, were again photo-

1 Formerly Bridger National Forest and Teton National Forest.

graphed in 1973. These photographs will be used as quantitative baseline data for comparison with photographs taken in the future when the Station begins operation.

ENTOMOLOGY

Bark Beetles

Mountain pine beetle, *Dendroctonus ponderosae* Hopkins

Lodgepole pine

Since the late 1950's, epidemic infestations of the mountain pine beetle have occurred in the Intermountain Region. Although records indicate that several major epidemics have occurred in this Region since the 1900's, the current series of outbreaks started in 1958 on the Wasatch National Forest in Wyoming and Utah. Since then, much of the lodgepole pine type in northern Utah, southern Idaho, and western Wyoming has been affected. With some localized variation, Regionwide tree killing reached its peak during the late sixties. All outbreaks are now declining.

Tree killing remained serious in several areas in 1973, but the most damaging infestation was on the Targhee National Forest. This outbreak is part of a large infestation which caused heavy tree losses in Yellowstone National Park, Wyoming, and on the Gallatin National Forest, Montana. Aerial survey records showed that the extent of the outbreak on the Targhee National Forest remained essentially unchanged from 1972, but there was a general intensification in a northeast direction. In the Island Park and Warm River areas, where chemical control was undertaken and then terminated in 1971, beetle populations resurged and tree killing increased in subsequent years, including 1973. In other areas, beetle-caused losses decreased or remained at a very low level (Fig. 1).

Since the termination of chemical control in the Warm River area, maximum efforts have been toward the harvesting of infested and ultimately threatened lodgepole pine. The site of the most concentrated activity was on the Moose Creek Plateau, which was in the direct path of the intensifying infestation and has been under attack for the past three years. However, because of the relatively high elevation, and other unknown factors which affect mountain pine beetle populations, the infestation on the Plateau has yet to reach serious proportions and may possibly even be on the decline. The results of two consecutive 35 mm aerial photographic surveys showed a buildup of the number of infested trees per acre from 0.7 in 1971 to 2.7 in 1972. Cursory on-the-ground data, taken in conjunction with the photo ground truth survey, indicated a slight reduction in the intensity of 1973 attacks to 2.3 trees per acre. Whether this decline is real and long term, only temporary, or simply due to sampling error, is unknown at this time. However, a similar decrease was measured on permanent trend plots immediately adjacent to the photo survey area in Yellowstone National Park, where the outbreak decreased from 1.9 trees per acre in 1972 to 1.4 trees per acre in 1973.

Heavy tree killing continued in the northern portions of the Bridger-Teton National Forest and Grand Teton National Park in Wyoming, but the outbreak continued its downward trend in other areas on the Forest and Park. However, an increasing infestation center was detected in the lower tributaries of the Gros Ventre River with heaviest tree killing occurring in Ditch Creek and on Antelope Mountain. Heavy tree killing was forecast for 1974 for most of the lower reaches of the Gros Ventre River, particularly in Horsetail and Slate Creeks.

The long-standing outbreak in the Greys River and along the west slope of the Wind River Range, Bridger-Teton National Forest, Wyoming, have continued to decline. In some areas, particularly at high elevations in the Bridger Wilderness, Wind River Mountain Range, beetle populations presumably reared in the low elevation lodgepole stands have moved into the widely scattered whitebark pine, *Pinus albicaulis* Engelm., and limber pine, *Pinus flexilis* James, stands.

A general resurgence in mountain pine beetle activity has been in progress for the past four to five years in several areas in northern Utah and southwestern Wyoming. Many of these areas were depleted when the extensive outbreak swept through portions of the Wasatch and Uinta Mountain Ranges during the late fifties and early sixties. Of these residual infestations, the most persistent have been in the Blacks Fork of the Green River, Wyoming and Utah, and the upper

Figure 1. Infrared (top) and color (bottom) aerial photographs show a lodgepole pine forest depleted by the mountain pine beetle near Indian Lake, Targhee National Forest, 1973. On the infrared photograph, purple colored trees are living and green trees are dead.

reaches of the Bear River, Wasatch National Forest, Utah. Less severe outbreaks of declining intensity persist in the upper drainages of the Provo and Weber Rivers, Wasatch National Forest, and in Current Creek and the West Fork of the Duchesne River, Uinta National Forest.

An infestation on the Ashley National Forest and the Flaming Gorge National Recreation Area increased in extent in 1973, but the intensity of the outbreak mostly lessened. Part of the infestation is in mixed lodgepole and ponderosa pine stands, but evaluation surveys indicated a reduction in the number of 1973 attacked trees for both species. Although tree killing is expected to decrease, there are indications that the infestation will spread westward into the Wasatch National Forest. Logging to remove some of the infested trees and salvaging some of the dead trees is underway in the Long Park area.

Widely scattered killing of lodgepole pine continued in portions of the Boise, Sawtooth, and Caribou National Forests, Idaho. On the Boise National Forest, sizeable increases in existing attack centers developed in the South Fork of the Boise River. On the Sawtooth National Forest, most mountain pine beetle activity occurred on the Ketchum Ranger District. The heaviest and most damaging infestation centers were in Warm Springs Creek and along the North Fork of the Wood River. In most areas, a sufficient number of susceptible trees remain to maintain a high rate of infestation for the next few years. Tree losses due to the mountain pine beetle continued in widely dispersed stands on the Caribou National Forest, but at a reduced rate.

Ponderosa pine

On a Regionwide level, killing of ponderosa pine by the mountain pine beetle was at its lowest point in five years. One of the most troublesome outbreaks persisted in mixed ponderosa and lodgepole pine stands in and around the Flaming Gorge National Recreation Area, Utah. The impact in high use recreation areas and sites, such as the Greendale Junction and Bootleg Campground, are causing the greatest concern. Trees occupy marginal growing sites and the stands are composed of stagnated second-growth and a few overmature trees in open areas. In the absence of silvicultural treatment, most trees will probably continue to be highly vulnerable to bark beetle attack.

The persistent infestation in Bryce Canyon National Park and on the neighboring Dixie National Forest continued to decline as predicted. Now that the epidemic has subsided and most tree mortality has occurred, an effort will be made in 1974 to collect information on the impact of this beetle and its effect on stand structure. In other areas of the Dixie National Forest, particularly on the Cedar City and Escalante Ranger Districts, widely separated tree killing continues but at a very low intensity. Most of the mortality is in isolated, large, overmature trees.

An outbreak in densely stocked, stagnated, second-growth ponderosa pine stands on private land near Cascade, Idaho, continued for the tenth consecutive year. Mortality of all size classes continued, but well under the high level of previous years. The extent of the infestation remained relatively static during most of this period, but showed signs of moving southwest onto the Boise National Forest. No control was planned.

Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins

This beetle continued to cause mortality of Douglas-fir in Idaho. Increasing infestations occurred on the Boise National Forest in southwestern Idaho and on the Targhee National Forest in southeastern Idaho. An outbreak on the Payette National Forest was static, while tree losses on the Challis and Sawtooth National Forests decreased. Elsewhere in the Region, losses were light.

On the Boise National Forest, increases in tree losses were detected in three general areas: south and west of Deadwood Reservoir, Emmett Ranger District; in the tributaries of the Middle Fork of the Boise River, Boise Ranger District; and near Anderson Ranch Reservoir, Mountain Home Ranger District. Salvage logging was recommended so that dead and infested material would be utilized.

Douglas-fir mortality on the Targhee National Forest has been increasing since 1969, when a Douglas-fir beetle outbreak was triggered by large accumulations of storm-damaged trees. Evaluation surveys conducted at the northern end of the Forest during 1973 showed that there was a 1.7-fold increase in newly attacked trees over the previous year. The average stand structure in numbers of trees per acre was as follows: 86.8 live, 1.7 infested, and 4.9 dead

Douglas-fir; and 32.8 nonhost trees. There was scattered tree mortality over most of the Douglas-fir type at the northern end of the Forest. Heaviest tree killing occurred on Bishop Mountain, Big Bend Ridge, and north of Sheridan Reservoir. Salvage logging was recommended.

A damage survey using 35 mm color aerial photography was initiated on the Boise National Forest during 1973. The survey area was near Lowman, Idaho, where a recent outbreak caused great concern over Douglas-fir beetle-caused mortality. The infestation has since subsided. Ground truth and other field data collection will be completed during 1974. This information should provide a sound estimate on tree losses incurred during the outbreak.

Engelmann spruce beetle, *Dendroctonus rufipennis* (Kirby)

For the fifth consecutive year, this beetle has caused heavy Engelmann spruce losses in upper Huntington Creek, Manti-LaSal National Forest, Utah. Damage surveys conducted in three stands show that from 26 to 82 percent of the merchantable volume (eight inches in diameter and above) was in dead trees. Many trees below eight inches in diameter also were killed. The only factor that will probably end this infestation is the eventual depletion of favorable host material. Losses are expected to continue next year, although at a reduced level.

Control by individual treatment of trees with chemicals was determined to be impractical.

Logging for salvage, of course, was recommended; however, watershed and access problems limited opportunities in many areas. In addition, only an exceedingly small proportion of the dead material could be salvaged because of limited mill capacities. There was an indication that logging efforts would be increased in 1974. Fortunately, the wood in standing trees remains sound for many years, which will permit salvage logging in the future.

Elsewhere in Utah, widely scattered losses were detected on the Uinta and Fishlake National Forests.

Roundheaded pine beetle, *Dendroctonus adjunctus* Blandford

An outbreak of this beetle and the western pine beetle, *Dendroctonus brevicomis* LeConte, in ponderosa pine in the Spring Mountains, Toiyabe National Forest, west of Las Vegas, Nevada, has subsided to a low level. In the past, killing of high-value trees near summer homes, campsites, etc., caused considerable concern. Even though the possibility of tree killing still exists, the threat has greatly decreased.

Pine engraver beetles, *Ips* spp.

Lodgepole pine

Trend and impact studies conducted in mountain pine beetle depleted and infested lodgepole pine stands on the Targhee National Forest have revealed extensive losses of small diameter trees by engraver beetles and possible other secondary bark beetles. These beetles breed in tops and other portions of trees not utilized by the mountain pine beetle. Once provided with the impetus of sheer numbers, they can successfully compete with mountain pine beetle broods in some of the larger trees and are primarily responsible for the death of many smaller diameter trees. During the past two years, breeding opportunities were further enhanced by extensive accumulation of storm-caused debris throughout most of the outbreak area. Even though it is impossible to assess the overall effect on stands due to these insects, there is little doubt that it is considerable.

Ponderosa pine

Potentially damaging populations of engraver beetles built up in slash on four completed logging areas and one thinning area in southwest Idaho in 1973. To prevent possible losses of nearby standing trees, slash was treated with a mixture of 1.5 percent lindane in oil using a backpack mistblower. Treatment areas, covering 130 acres, were located at Virgil Gulch, Trail Creek, and Long Gulch on the Boise National Forest and on a private sale near Idaho City. No live trees within or adjacent to the treated units were lost. By comparison, engraver beetles in untreated slash on a State of Idaho sale near Centerville, Idaho, emerged and caused group killing of standing trees.

DEFOLIATORS

Western spruce budworm, *Choristoneura occidentalis* Freeman

The western spruce budworm continues to be the

most important defoliator of Douglas-fir and true fir stands in the Intermountain Region. However, overall defoliation in 1973 was less than that recorded in 1972. Further decreases were predicted for 1974. The Region has had a long and continuous period of budworm activity dating back to 1951. Since then, infestations increased in area and intensity, mostly in southern Idaho, and by 1964 covered more than two million acres. Natural population declines, aided by a series of control programs during the periods of 1954-57 and 1963-64, reduced the extent of infested acreage to its present tolerable level (Table 1).

In some areas on the Payette National Forest feeding damage increased, but the cumulative acreage decreased to about half that recorded in 1972. The amount of defoliated area also diminished on the Boise, Challis, and Salmon National Forests (Table 2).

The most significant decline in budworm activity occurred in portions of the Bridger-Teton and Targhee National Forests, Wyoming and Caribou National Forest, Idaho. From an initial discovery of 10,000 acres of light defoliation on the Bridger National Forest in 1965, the infestation spread to three neighboring Forests, and by 1968 the number of infested acres increased to slightly more than 132,000. The following year budworm populations and subsequent damage began a downward trend, and by 1972 the defoliated area was reduced to 66,000 acres. Natural factors continued to take a heavy toll of the budworm population, and by 1973 there was no visible defoliation. It appears now that the most important damage sustained by these stands during the eight-year outbreak was growth loss, negligible mortality of suppressed understory in localized areas, and some top kill.

Predictions of decreasing budworm activity for 1974 are even more encouraging than those made for 1973. Egg mass survey data indicate that there will be a further decline in 1974. Some areas of heavy defoliation will continue, particularly on the Payette National Forest. Egg mass counts were exceptionally low in the Bridger-Teton infestation, indicating the occurrence of negligible to very light defoliation. No control is planned.

Douglas-fir tussock moth, *Hemerocampa pseudotsugata* **(McDunnough)**

An outbreak of this moth occurred over 11,000 acres in southern Idaho in 1973. Moderate to heavy defoliation was observed in widely scattered locations from Featherville, Idaho, eastward to the Little Lost Reservoir area, and in Owyhee County southwest of Boise, Idaho. The infestation centers were on Sawtooth National Forest, Bureau of Land Management, State, and private lands. With the exception of two areas totalling only 1,200 acres, tussock moth populations and subsequent damage should decline in 1974. A control program may be undertaken to suppress potentially damaging populations in the 1,200-acre tract.

At the northern end of the Las Vegas Ranger District, Toiyabe National Forest, Nevada, scattered defoliation of white fir, *Abies concolor* (Gord. & Glend.) Lindl., occurred for another year. A total of about 140 acres was defoliated. An egg mass survey conducted in November 1973 indicated that the population was declining. Control was not recommended.

Pine butterfly, *Neophasia menapia* **(Felder & Felder)**

Pine butterfly activity began an upswing in 1968 on the Payette and Boise National Forests. In 1972, 4,400 acres of heavy defoliation and 2,400 acres of moderate defoliation were recorded along the main Salmon River on the Payette National Forest. The extent of defoliation in 1973 remained essentially unchanged; however, there was a marked reduction in the amount of heavy defoliation. Egg mass data collected during 1973 surveys indicate a downward trend in butterfly populations on the Payette National Forest.

A new infestation center was detected near Centerville, Idaho, Boise National Forest in 1973. The total area and intensity of defoliation are unknown, because an aerial survey was not conducted in the area. Nevertheless, heavy defoliation was predicted for 1974 as a result of an egg mass survey.

A sawfly, *Zadiprion townsendi* **(Cockerell)**[1]

Larvae of this defoliator were found actively feeding

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[1] Larval specimens identified by D.R. Smith, Systematic Entomology Laboratory, Agric. Res. Serv., USDA, Washington, D.C. 20560

Table 1. Cumulative acreages of western spruce budworm defoliation in the Intermountain Region recorded during aerial reconnaissance surveys, 1973.

	Acres of Defoliation			
Year	Light	Medium	Heavy	Total
1964	266,000	658,000	1,352.000	2,276,000
1965	465,600	254,500	795,200	1,515,300
1966	923,900	52,200	16,100	992,200
1967	162,200	54,900	1,600	218,700
1968	33,500	150,200	21,800	505,500
1969	388,800	125,400	30,200	544,400
1970	223,200	79,300	5,200	307,300
1971	229,300	110,300	34,300	373,900
1972	395,300	100,700	9,500	505,500
1973	99,700	76,400	48,000	224,100

Table 2. Cumulative acreages of western spruce budworm defoliation by National Forest in the Intermountain Region, 1973.

	Acres of Defoliation			
Forest	Light	Medium	Heavy	Total
Boise	3,700			3,700
Challis	16,400			16,400
Payette	79,200	76,400	48,000	203,600
Salmon	400			400
Total	99,700	76,400	48,000	224,100

in a ponderosa pine plantation on Chippean Ridge, Manti-LaSal National Forest, near Blanding, Utah, on November 2, 1972 (Fig. 2). At the time of discovery, there was at least one inch of snow on the ground. Larvae were collected, brought into the laboratory, but attempts at rearing them to the adult stage failed. This is the first known record of this insect in Utah.

Figure 2. **A sawfly larva,** *Zadiprion townsendi* **(Cockerell).**

A leafroller, *Archips negundanus* **(Dyar)**

An outbreak of this insect on boxelder, *Acer negundo* L., continued for a sixth consecutive year in northern Utah. Defoliation of trees in and around homes, golf courses, parks, and recreation sites caused some concern, but trees quickly refoliated.

A defoliator

Although a positive identification has not been received, a possible infestation of the ugly-nest caterpillar, *Archips cerasivoranus* (Fitch), caused extensive defoliation of several plants in canyon bottoms throughout the east slope of the Grand Teton Range, Wyoming. Choke cherry, *Prunus virginiana* (A. Nels.) and snowberry *Symphoricarpos* sp., were heavily defoliated in some areas. Aspen, *Populus tremuloides* Michx., and a number of shrubs and herbaceous plants were also affected.

PATHOLOGY

Dwarf mistletoe, *Arceuthobium* **spp.**

Dwarf mistletoe continued as the most destructive disease in forest stands of the Intermountain Region. Conservative annual timber losses from dwarf mistletoe are estimated at 135 million board feet.

Arceuthobium americanum Nutt. ex Engelm., lodgepole pine -- Two control projects, the Bartlett Cutover and West Campbell Cutover, were conducted on the Ashley National Forest. A combined total of 200 acres of lodgepole pine was treated on the two areas. Control on both projects consisted of removal of infected overstory cull trees and sanitation thinning of infected advanced lodgepole pine regeneration. Post control evaluations on Bartlett Cutover revealed a reduction in percentage of trees infected from 14 to 1.4 percent. Two dwarf mistletoe control projects were completed on the Sawtooth National Forest: North Cherry Creek, 70 acres, and Prairie Creek, 82 acres. Treatment at both areas consisted of girdling all overstory infected cull trees and sanitation thinning in the understory.

Arceuthobium douglasii Engelm., Douglas-fir -- A control project was conducted by State of Idaho personnel on 50 acres in the Thorn Creek area following a Douglas-fir timber sale. Treatment consisted of felling infected cull trees and sanitation-thinning of advanced regeneration.

A post-control evaluation of a project conducted on the Targhee National Forest in fiscal year 1972 revealed that all overstory sources of infection had been removed. The understory infection was reduced from 54 to 29 percent. The average stand diameter at breast height was raised from 2.6 to 4.4 inches and average height from 16 to 24 feet.

Post-control evaluation of a project conducted on Little Flat Top Mountain, Bridger-Teton National Forest, in 1971 revealed a reduction in dwarf mistle-

toe infection level from 13 to 2.6 percent. All overstory source of infection was also removed. Height growth had accelerated.

Air pollution

Previously established vegetation plots on Federal lands north and east of the Navajo Generating Station near Page, Arizona, were photographed. Four of these vegetation plots are on the Glen Canyon National Recreation Area, and three are on Bureau of Land Management lands north of the Glen Canyon National Recreation Area. These photographs will serve as a baseline against which similar photographs will be compared when the Generating Station begins operation.

Other vegetative plots were established on the Kaiparowits Plateau. This plateau (7,000 feet and higher) is a major barrier to airflow out of the basin in which the Navajo Plant is located. Thirty-three vegetative species were identified in these various plots, 13 of them are species which have been noted to be sensitive to SO_2 in various fumigation studies: aspen, ponderosa pine, mallow, alfalfa, snake week, Utah juniper, cliffrose, spiny hopsage, gambel oak, salt brush, big sagebrush, squaw bush, and pinyon pine. They occur commonly throughout southern Utah and will be utilized to determine the effects, if any, of emmissions from the Navajo Generating Station.

DISTRIBUTION OF MAJOR FOREST INSECT INFESTATIONS IN REGION 4 *

1973

LEGEND

- *Mountain Pine Beetle*
- *Douglas-fir Beetle*
- *Western Spruce Budworm*
- *Engelmann Spruce Beetle*

Based on aerial and ground surveys

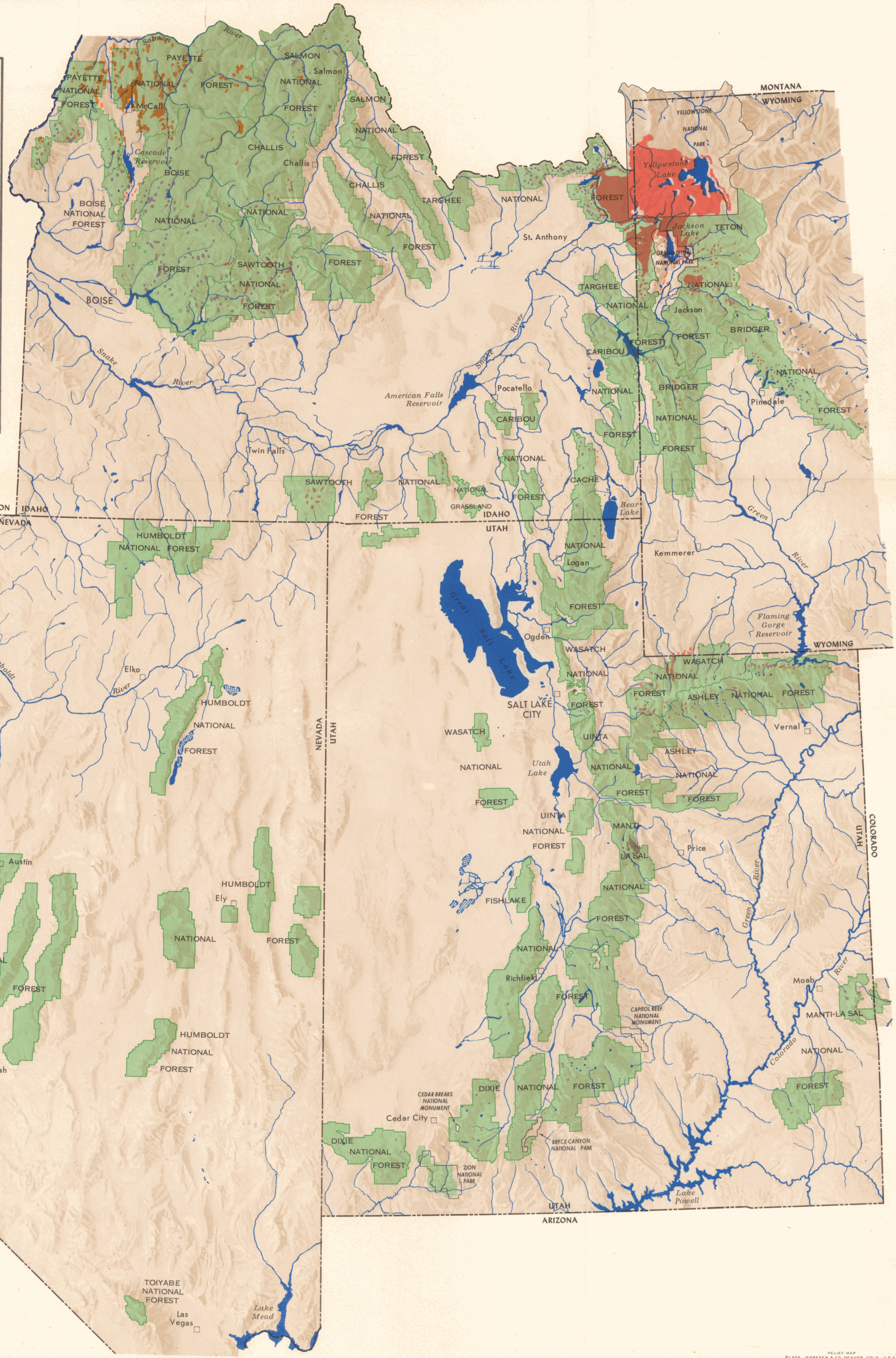
DIVISION OF TIMBER MANAGEMENT

FOREST SERVICE

U.S. DEPARTMENT OF AGRICULTURE

SCALE *miles* 0 40

*Recent reorganization has resulted in numerous boundary changes which are not shown on this map.



RELIEF MAP
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